V. *Part of a Letter from Monſieur* Claud. Joſeph Geoffroy, F. R. S. *to* David Hartley, *M. A.* F. R. S. *containing his Method of making* Soap-lees *and* Hard Soap, *for Medicinal Uſes.*

SIR, *Paris, July* 23. 1741. *N. S.*

Read April 1. 1742.

TO make the Lye, I take, for Inſtance, of the beſt calcined Lime, that has been the leaſt expoſed to the Air, 5 ℔; of good Salt of *Kali* or Glaſs-wort of *Alicant*, pulverized, and paſſed through a fine Sieve, 10 ℔. I divide the Lime and the Salt of Glaſs-wort (called in *England Barillia*) into two equal Parts; then I put the Lime, broken into Pieces not bigger than an Egg, into new ſtone Pans, and cover it with as much Salt of Glaſs-wort as is deſigned for each Pan. I pour afterwards on theſe ſeveral Mixtures hot Water by little and little, to give Time to the Lime to open itſelf, till it turns into a ſort of Meal, which will happen after I have poured Three half Pints * into each Pan. I then add to it the reſt of the Water that is required, ſtirring this Mixture with a Stick of white Wood; when there are Eighteen or Nineteen Quarts of Water in each Pan, there is enough for diſſolving the Salts. In this State the Pans are left for Twelve or Fifteen Hours; after which this Lye is filtrated

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* The *Paris* Pint is near a Quart *Engliſh.*

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through brown Paper, ſupported by a coarſe Cloth, fixed to the Four Corners of the filtring Frame. When the whole Maſs of the Lye and of the Lime is well drained, I put it into an iron Pot that is very clean, with Ten Quarts of Water, to the Quantity taken out of each Pan, and let it boil an Hour; then I filtrate it a ſecond time. Afterwards it is put into another iron Pot that is very clean, and as it evaporates by Degrees, it is filled up again with the firſt Lye prepared, without boiling. I let it continue to evaporate till the Twenty-eight Quarts of Water, that have been uſed for making the Lye of the Mixture that was at firſt put into each of the Pans, be reduced to Two Quarts and half a Pint, or ſo long till a ſmall ſalinous Film forms itſelf on the Top of the Lye. This Liquor turns almoſt black, becauſe it corrodes the Iron; but this is no Inconvenience, as will appear hereafter. In this State of Concentration, if one lets a Drop of it, whilſt it is hot, fall on a Piece of Glaſs, it will be very quickly covered with a fine and greaſy Film, which makes it look as if it was congealed. At the Bottom of this Lye is found a Salt in Flakes, which, being melted in a Crucible, produces a *Lapis infernalis* of a ſtrong cauſtic Power. One may know alſo, that the Lye has acquired the neceſſary Degree of Concentration, when, becoming more active, one ſees, that the Edge of the Pot that has been wetted by it, turns red, whilſt the lower Part of the Side all around, down to the Surface of the Liquor, takes a greeniſh Colour. Then the Pot muſt be taken from the Fire, and the Liquor left to cool ſo far as to be put into Glaſs Bottles without cracking them: The Bottles ought to be carefully corked,

corked, not only to prevent the Salts contracting a Dampneſs from the Air, which would leſſen the Degree of forced Concentration, which has been acquired by the Evaporation, but alſo to preſerve what is ſulphureous, which would exhale, if the Liquor remained long expoſed to the Air: For I ſuſpect, that that ſort of *Hepar*, formed by the Union of the cauſtic Salt with the Sulphur of the Aſhes of the Glaſs-wort, ought not to be neglected. Now, the better to direct thoſe who have a mind to work after theſe Proceſſes, and to furniſh them with the Degrees of Concentration this Lye is to have, in order to make with Oil a ſolid Soap out of it as ſpeedily as poſſible, I take a glaſs Phial with a narrow Neck, and fill it with clear Water up to a Mark made on the Neck. That which I now make uſe of, being filled up with Water to that Mark, contains juſt Three Ounces: I afterwards empty it carefully, and, inſtead of clear Water, I fill it with that concentrated Lye as far as the foreſaid Mark, and then I weigh it. If the Weight be increaſed Eight and an half or Nine Drams, that is, near Three Drams in each Ounce, this ſhews that the Lye is neither too much nor too little concentrated. An hydroſtatical Balance, a Water-poiſe, and other Inſtruments, might alſo give this Degree; but in the Country they are not at hand, and I judged it beſt to point out only what is moſt eaſy. Soap-boilers uſe for this End a freſh Egg; if one half of it ſinks into the Lye, they judge the latter to be of the firſt Strength, that is to ſay, that this is the Lye which they ought to employ laſt of all in their Manufacture; if the Egg ſinks in to Two-thirds, the Lye is called the Second; and, laſtly, if the Lye covers the whole

Surface of the Egg, it will be called the Firſt, and will be that with which they begin their Operation or Boiling. But this way of trying has not all the Exactneſs which can be deſired, becauſe all Hens Eggs have not the ſame ſpecific Gravity. Beſides, as I make my Soap without Fire, I muſt take the Lye that is moſt concentrated.

Leſt the Iron, which is corroded by the Lye, ſhould enter into the Compoſition of the Soap, one need only to evaporate the Lyes in earthen Pans put over a *Balneum Mariæ*; but as this Evaporation is ſlower, it will conſume much more Coals. One may even ſee in thoſe Pans by different Marks, that the Liquor approaches the deſired Degree of Concentration, partly by a Piece of Wood marked with Notches, partly becauſe if there is the leaſt ferruginous Speck in the Earth of thoſe Pans, the Liquor will penetrate that ferruginous Place, and make a Spot there. By uſing earthen Pans you will get a very limpid Liquor, and which will only have a very pale Straw-colour, even after its perfect Concentration.

The Lye prepared in Iron, being kept for ſome time, clears up, and leaves a black Sediment, which is that Part of the Iron which it has ſeparated by corroding the Sides of the Pot. And yet this ferruginous Lye, together with the Oil, will form a white Soap, if one has let that black Sediment precipitate. This Sediment is true Iron: I have made myſelf ſure of it, by calcining it in a Crucible, after having moiſtened it with Oil.

One Ounce of concentrated Lye to the Degree above-mentioned contains Three Drachms Eighteen Grains of Salt; when I diſſolve this Salt again in diſtilled Rain-water, and filtrate it, I find in it Three Grains of coarſe Earth, which cannot penetrate the Pores of the Filtre.

If I uſe it to make Soap of it, I take one Part to two Parts of the beſt Oil: I mix them gently in a *China* Bowl, ſtirring them with a *Spathula* of white Wood, till both Liquors are come to a Conſiſtence of Butter that is churning: This Thickening is much ſooner done in Winter than in Summer. I keep the Veſſel in a dry Place, that the Moiſture of the Air may not diminiſh the Strength of the Lye. The Mixture from Day to Day grows to a Body, and when it is in the Sun in Summer, and upon the Mantle of the Chimney in Winter, the Phlegm evaporating ſooner, it becomes perfect Soap in Four or Five Days, provided the Lye be ſufficiently concentrated. It will be well however, that during the time the two Liquors are binding together, the Mixture be ſtirred with the *Spathula*, that the Water may not be kept in, but evaporate the ſooner. When the Soap is made, it eaſily comes out of the Veſſel, but it has not yet loſt all that Moiſture it ſhould loſe; ſo that though one may uſe it in that State, yet it is better to keep it Twelve or Fifteen Days longer; at the End of which Time if I decompound it, I always find the whole Oil I have employed; that is to ſay, out of Eighteen Drachms of this perfect Soap, I get one Ounce and an half of Oil, and Two Drachms Twenty-three or Twenty-four Grains of Salt of Glaſs-wort. So after this Method a Patient may eaſily make his own Soap, and be ſure of the Ingredients; perhaps even in the great Manufacturies, one Day or other, they may prefer this to that which is now in Uſe.

As to what relates to the Oil of Lime *, of which I have ſpoken in my Experiments, it is the *Caput Mortuum* of the *Sal Ammoniac*, after Diſtillation of the volatile Spirit by the means of Quick-lime; it is expoſed in a flat Veſſel to the Moiſture of the Cellar, whence a *Deliquium* is formed, which we call Oil of Lime. It is Lime diſſolved by the means of the Acid of the Sea-ſalt, which is contained in the *Sal Ammoniac*; other Chymiſts call it the fixed Liquor of *Sal Ammoniac*. Your Soap-boilers are obliged to add Sea-ſalt to their Soap, which I believe, for my part, comes from their making uſe of Pot-aſh in their Lyes, which they would have no occaſion to have recourſe to, if they employed true Salt of Glaſs-wort, ſeeing my ſtrong Lye of Salt of Glaſs-wort makes Soap immediately; beſides, the Salt of Glaſs-wort contains Sea-ſalt, which I have demonſtrated by making Salt of *Glauber* with pure Salt of Glaſs-wort and Oil of Vitriol: If inſtead of Salt of Glaſs-wort one makes uſe of Pot-aſh with Oil of Vitriol, it will not make Salt of *Glauber*, but inſtead of it produce Tartar vitriolate.

In deſcribing this ſort of Soap, I had no other View, than not to deviate from the way of making *Alicant Soap*, and to know well the Proportions, in order to apply them to the making of the Soap I propoſe, and to fix them with regard to the Lime and the Salt of Glaſs-wort, which for many and various Reaſons is preferable to other fixed Salts, as being that which forms the beſt, the moſt deterſive, and the mildeſt Soap, as it has been found by Experience in all our Manufactories.

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* Huile de Chaux.

The Obſervations which I have lately laid before the Academy, prove that the Oil, which has paſſed through the Lyes of Lime and of Salts, is, perhaps, eaſier to digeſt than any other. I there demonſtrate, that the Oil ſeparated from the Soap by the means of Acids, as I have pointed out, is found to have acquired a Property which it had not before; for it diſſolves in Spirit of Wine, and perfectly unites with it; which it could not do whilſt it was crude, that is to ſay, before it had formed Soap, or had been boiled with metallic Limes.

VI. *A Letter written to the moſt Reverend Father D.* Cla. Fremond *Calmad, publick Profeſſor in the Univerſity of* Piſa, *giving an Account of the Earthquakes felt in* Leghorn, *from the 16th to the 27th of* January 1742. *With ſome Obſervations made by the moſt Reverend Sig.* Paſqual *R.* Pedini, *Principal of the Clergy of the moſt eminent College of the ſaid City. Communicated to the* ROYAL SOCIETY *by* James Jurin, *M.D.* F. R. S. *&c.*

Read April 8. 1742.

IN Obedience to your Commands, I tranſmit you an Account of the Earthquakes felt in *Leghorn*, from the 16th to the 27th of

January.